ECONOMIC BURDEN OF UNINTENTIONAL INJURY IN BRITISH COLUMBIA

Report Prepared on Behalf of BCIRPU

B.C. *Injury* Research

AND·PREVENTION·UNI

by

SMARTRISK

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The British Columbia Injury Research and Prevention Unit (BCIRPU) directed by Dr. Parminder Raina, was established by the Minister of Health and the Minister's Injury Prevention Advisory Committee in August 1997. BCIRPU opened its doors in January 1998. It is housed within the Centre for Community Health & Health Evaluation Research (CCHHER) at Children's & Women's Health Centre of British Columbia and supported by the BC Research Institute for Children's & Women's Health. The primary purpose of the unit includes "The reduction of unintentional injuries among children and youth in BC through the support and evaluation of effective prevention measures, and the establishment of ongoing injury surveillance across the province."

SMARTRISK is a national, non-profit organization dedicated to preventing unintentional injuries. Dr. Robert Conn, a pediatric heart surgeon, founded the organization in 1991. SMARTRISK's mission is to help people see the risks in their everyday lives and to show them how to take those risks in the smartest way possible so that they can enjoy life to the fullest.

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BRITISH COLUMBIA
Research Institute For Children's & Women's Health

FOREWORD

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Introduction

Injury has recently been identified as a major public health problem in Canada and a significant threat to the economy, health care system and overall quality of life. Although the greatest cost of injury is in human suffering and loss, the financial costs are far from trivial. A landmark study unveiled the staggering costs of unintentional injury in Canada amounting to some $8.7 billion (SMARTRISK, 1998).[1] Nationally, injury ranks third behind cardiovascular and musculoskeletal disease in terms of societal economic burden (Health Canada, 1997). Yet, it ranks last in terms of the research share of the total costs and it persists as a predominantly hidden epidemic.

There are two categories of injury: unintentional and intentional (murder, acts of violence and suicide). Unintentional injuries, which are very responsive to prevention, include falls, motor vehicle crashes, railway and pedestrian injuries, drowning and suffocation, poisoning and fires.

Other countries have recognized injuries as a major threat to human health and well-being and they have devised action-oriented responses. The United States now has a National Centre for Injury Prevention and Control (Sleet et al., 1998) and the British government has recently identified injury as one of five health priorities along with heart, stroke, cancer, and mental health (Department of Health, 1998).

Gaining a better understanding of the economic dimensions of major health threats is a fundamental input to the process of establishing resource allocation priorities. The overall objectives of this study on the Economic Burden of Unintentional Injury in British Columbia are to uncover the health care costs and societal productivity losses attributable to unintentional injury and to highlight unintentional injury as a key health policy issue.

[1] The Economic Burden of Unintentional Injury in BC is based on a more comprehensive review of the literature which is available from the SMARTRISK website - www.smartrisk.ca/library.html

The British Columbia Context

From the extent of effort that British Columbians have invested in injury prevention, it is clear that they are concerned about addressing preventable health problems. It is evident that injuries kill and disable people every day and they cost money. But how much money is spent on injuries? The BC Injury Research and Prevention Unit, in collaboration with SMARTRISK, wanted to determine the health care costs and other societal costs associated with unintentional injuries.

This report goes beyond the economic consequences of this public health threat to proposing possible solutions for reducing human pain, suffering and grief. The ultimate goal is to build upon BC's strong tradition in injury prevention towards a truly integrated and coordinated injury prevention and control strategy both within the province and nationally.

It is hoped that the results of this study will provide the necessary economic rationale and information for policy makers, providers, managers, and citizens to make recommendations surrounding injury prevention as well as to improve existing treatment and rehabilitation approaches. These discussions would encompass behavioural changes, programming initiatives, communications strategies, engineering strategies, legislative, regulatory and enforcement initiatives, community outreach programs, injury- and age-specific education initiatives and an extension of injury prevention networks and coalitions that would be necessary to bring about significant reductions in unintentional injuries. In addition, recommendations for improving the measurement and reporting of injury information could be important by-products of this study.

Approach To The Study[2]

Economic burden of illness or cost of illness (COI) studies are used to characterize the economic dimensions of various health problems/conditions as a key input for planning, budgeting and priority setting. Often, the burden of specific illnesses is compared to the gains or return on investment available from prevention and control programs.

COI studies generally follow two approaches – prevalence costing or incidence costing. Prevalence costing captures all costs incurred in a given year. The major limitation with this approach is that the full episode of illness, which may span multiple years or a full lifespan, is not captured. In contrast, the incidence costing method assigns all costs (present and the future stream) to year of injury occurrence. Therefore, for all injuries occurring in a given year, the present and future costs associated with the full episode are captured. The stream of future costs is discounted to a present value. Hence, with this approach, the cost of an injury occurrence (i.e. full episode) can be compared to the cost associated with the prevention of that injury. Prevention costs are actually investments. For example, 1 dollar spent on bicycle helmets averts 29 dollars in injury costs (CDC, 2000).

Cost-of-illness studies distinguish and measure both direct and indirect costs.

Direct costs could be generally considered health care costs, including goods such as medications, prostheses, and services such as health care provider consultations involved in treatment and rehabilitation.

Indirect costs are societal productivity losses which account for the individual's inability to perform his or her major activities which result from the injuries. Indirect costs are generally captured through measuring foregone/lost income. As well as these economic costs, there are certain intangible costs associated with injuries such as pain and suffering, economic dependence and social isolation. While these costs are difficult to quantify in economic terms, they are costs nonetheless and should at least be identified. This study did not attempt to quantify these costs, hence, the indirect costs uncovered can be considered conservative.

The vast majority of injury data in Canada relate to inpatient hospital stays. While there are some outpatient data, there are generally no data available for ambulatory care or long term community care. For example, the costs associated with a spinal cord injury resulting in permanent paralysis are generally limited to the hospital stay and the lifetime costs are essentially unknown. In order to address this limitation and to capture full episodic costs associated with the various types of unintentional injury, this study employed a unique approach.

[2] Refer to Appendix C for methodological detail.

An Electronic Resource Allocation Tool[3] (ERAT) was developed for BC which embodies a classification and costing framework designed around existing provincial injury data and data available from the injury costing literature. In essence, the ERAT combines existing data with variables from the literature in order to model full episodic costs for various injuries, ranging from falls to motor vehicle crashes to drownings. The ERAT is a flexible tool that can be updated as more/better data become available and according to changes in population, injury incidence and treatment patterns/costs.

[3] For a more detailed description of the construction of the ERAT see www.smartrisk.ca/library.html

Results[4]

This study assesses the following injury and mortality figures to determine overall annual costs.

Injury Deaths	Hospitalized Injuries	Non-Hospitalized Injuries	Total Injuries	Injuries Resulting in Partial Permanent Disability	Injuries Resulting in Total Permanent Disability	Total Annual Cost
1,556	26,687	395,688	423,931	9,002	737	**$2.1 Billion**

TOTAL COSTS

In 1998 preventable injuries cost the people of BC $2.1 billion or $513 for every citizen. Falls accounted for $728 million or 36 per cent of the total amount. Motor vehicle crashes cost $428 million or roughly 21 per cent of the $2.1 billion. Poisonings represent 11 per cent of total costs in BC at $216 million. The remaining 32 per cent of total costs can be attributed to a combination of costs incurred by drowning, fires, and a range of other injuries not specified by hospital classification systems (see fig. 1). On average, each injury generates almost $5,000 in direct and indirect costs.

DIRECT COSTS

The 424,000 injuries in 1998 accounted for $852 million in direct health care costs (see fig. 2). The most costly injuries were falls, totalling almost $437 million or 51 per cent of total direct costs, and motor vehicle crashes at $131 million or 15 per cent of direct costs (see fig. 3). The people of BC spent $15 million treating patients for poisoning (2 per cent of total direct costs).

These three types of injury – falls, motor vehicle crashes and poisoning – made up about 68 per cent of direct costs. Caring for the injured elderly amounted to $211 million or 25 per cent of the $852 million in direct costs. Roughly $180 million (85 per cent) of the direct cost of elder injuries is attributable to falls (see fig. 4) where approximately 73 per cent of the costs (almost $131 million) are generated by falls among elderly women (see fig. 5). Direct costs associated with treating children and youth for falls were almost $96 million or 22 per cent of the total fall amount, with males representing 27 per cent more cases than females (see fig. 6).

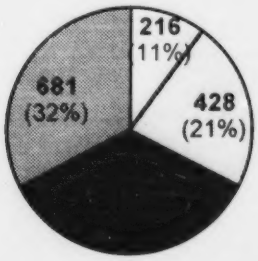
Although only 6 per cent of patients injured ended up in hospital, the cost of hospitalization generated 23 per cent or nearly $194 million of the $852 million spent on direct costs. However, 93 per cent of the injuries assessed were not hospitalized, accounting for 77 per cent or an estimated $659 million of the total direct costs.

RESULTS

[4] For tables detailing the results of the study see Appendix B.

FIGURE 1

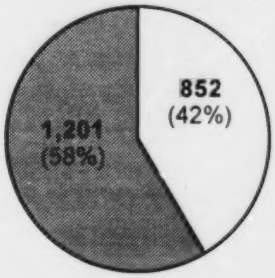
Total Costs by Injury Type (Millions $)
(total costs = $2,053)



□ Poisoning □ Motor Vehicle ■ Falls ▨ Other

FIGURE 2

Total Costs of Unintentional Injuries (Millions $)
(total costs = $2,053)



□ Direct Costs ▨ Indirect Costs

FIGURE 3

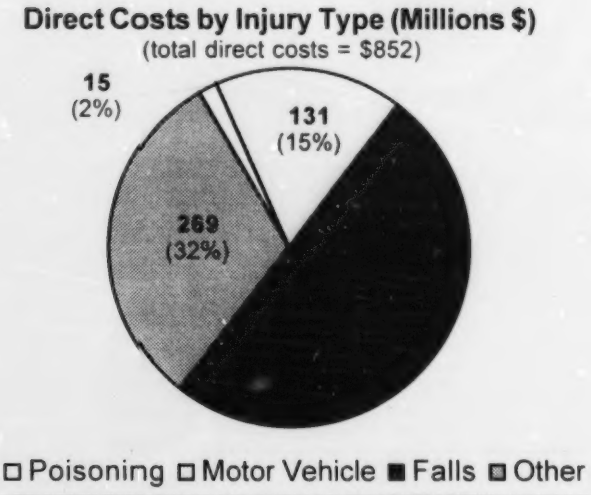
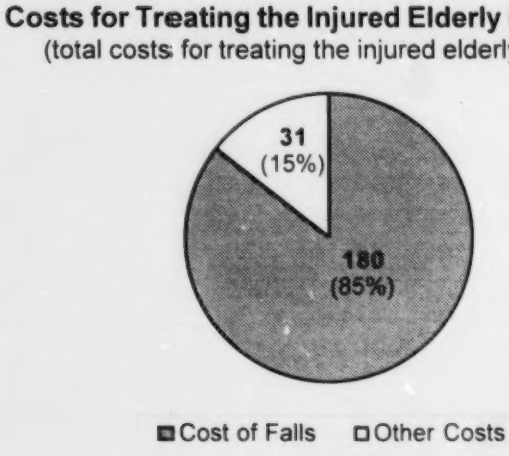


FIGURE 4



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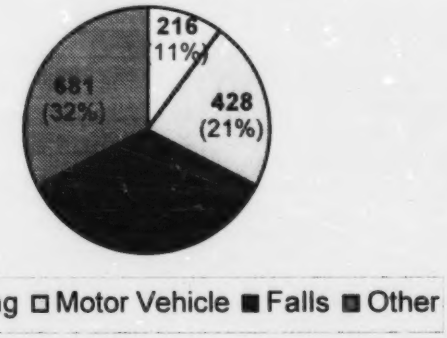

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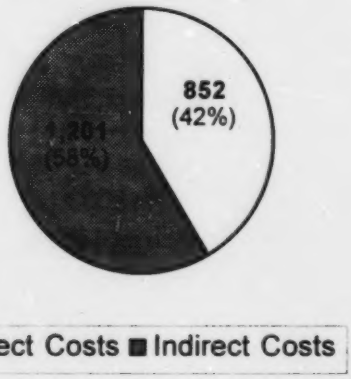

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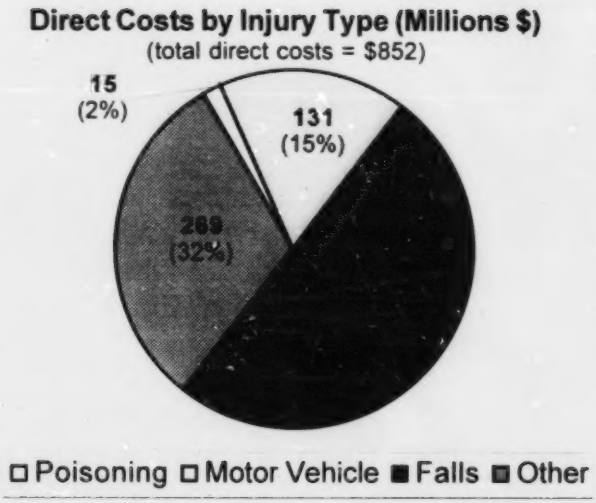

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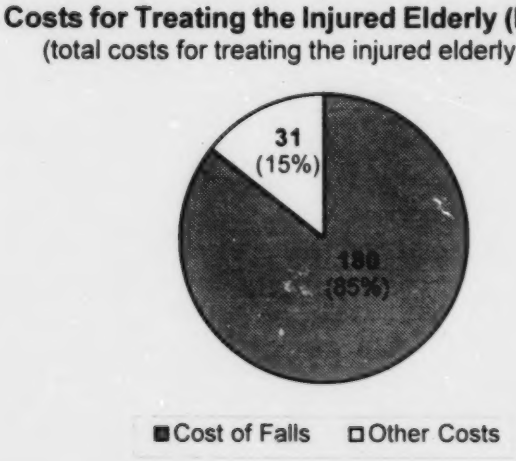


FIGURE 5

Total Costs of Falls by Gender and Age Group (Millions $)
(total costs of falls = $728)

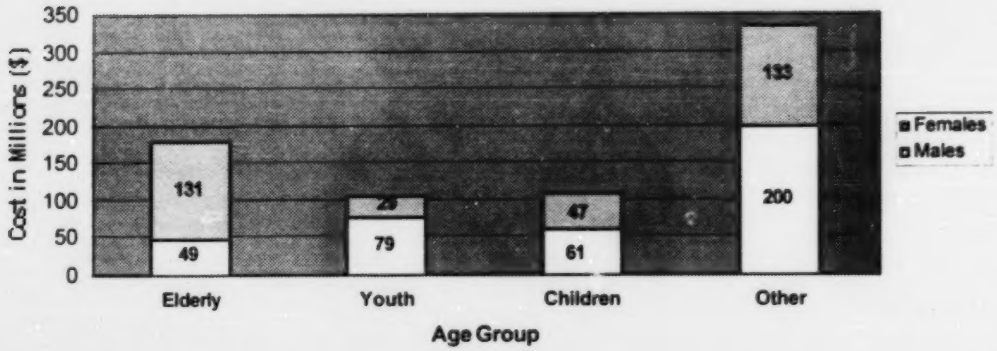
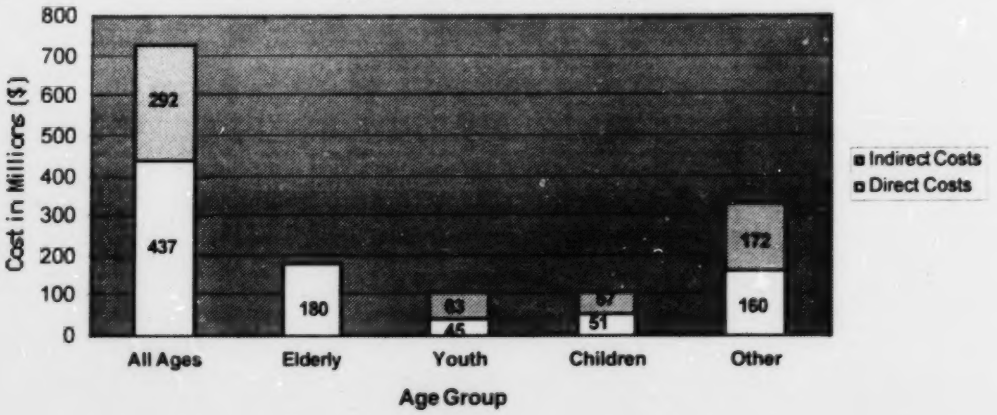


FIGURE 6

Direct and Indirect Costs of Falls by Age Group (Millions $)
(total costs of falls = $728)



INDIRECT COSTS

The 11,295 injuries that led to permanent disability or death amount to $1.2 billion in indirect costs (see fig. 2). Permanent disability caused the greatest losses in productivity, amounting to almost $713 million or 59 per cent of indirect costs. Injuries causing death accounted for about $484 million of the $1.2 billion total (see fig. 7).

The two most significant types of injury causing permanent disability were falls and motor vehicle crashes, generating over $413 million in indirect costs. Falls accounted for $273 million (38 per cent). Motor vehicle crashes cost $141 million (20 per cent) of the total disability-related indirect costs (See fig. 8).

FIGURE 7

Sources of Indirect Costs (Millions $)

(total indirect costs = $1,201)

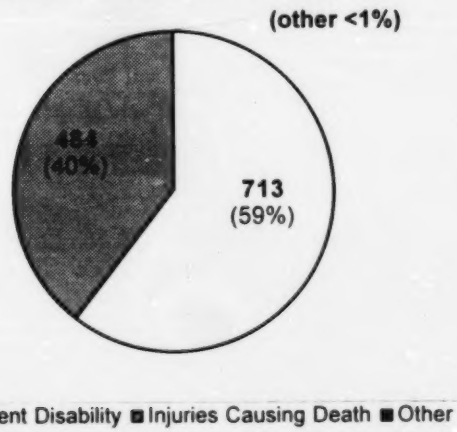
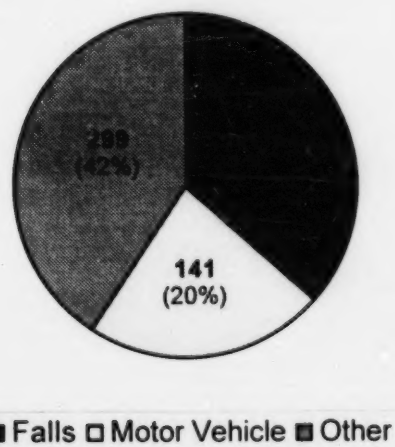


FIGURE 8

Indirect Disability Costs by Injury Type (Millions $)

(total indirect disability costs = $713)



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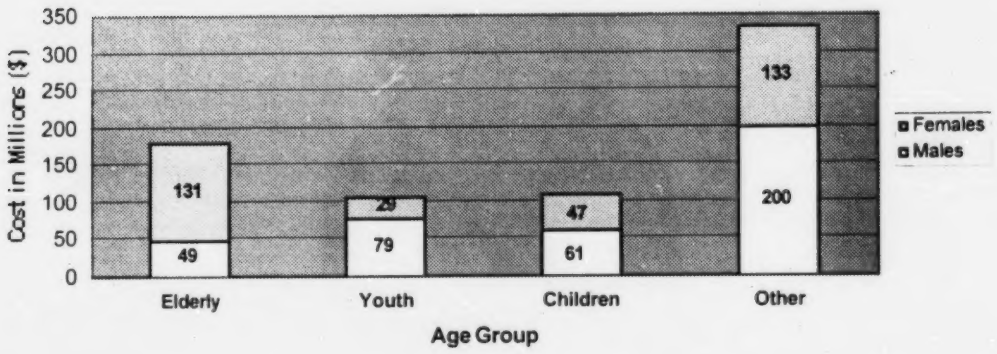

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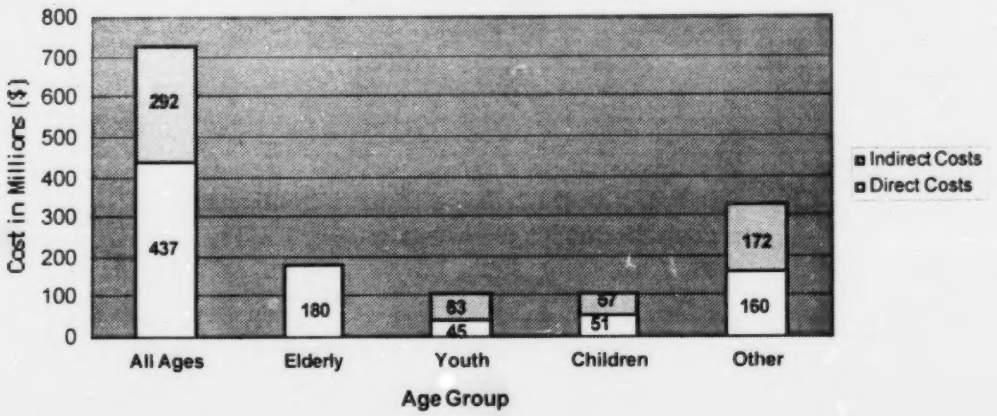

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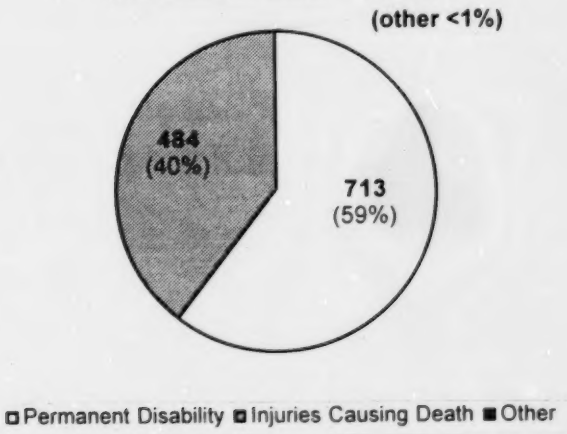

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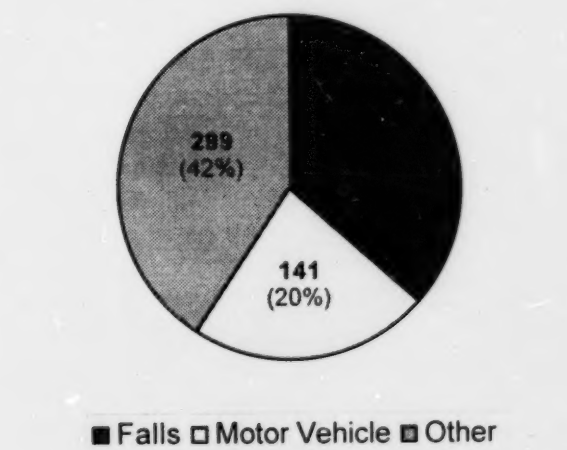


The Cost of a Silent Epidemic

The staggering costs determined by this study prove that BC, like the rest of Canada, is suffering from an injury epidemic. Yet, this epidemic is silent because, generally, people do not see the risk in their everyday lives. If they do not see the risk, they cannot take measures to navigate that risk in order to prevent potential injury. Given the staggering monetary and personal costs associated with injuries, why do individuals not perceive the risk in their lives?

While health risks such as heart attacks or strokes are perceived as having relatively predictable causes, injuries tend to be dismissed as "accidents." Injuries are not accidents but are predictable and preventable. Investing in injury prevention can save money and lives. By focusing on prevention, BC could save much of the almost $900 million spent each year on 424,000 injuries.

Injury Prevention Cuts Costs

If injuries are largely preventable, then how much more money and how many more lives could BC save by enhancing existing strategic prevention programs? There is a stark contrast between the cost of preventing injuries and the cost of treating injuries. Prevention always costs less[5] :

- $1 spent on smoke alarms saves $69
- $1 spent on bicycle helmets saves $29
- $1 spent on child safety seats saves $32
- $1 spent on road safety improvements saves $3
- $1 spent on prevention counselling by pediatricians saves $10
- $1 spent on poison control services saves $7

The following scenarios illustrate how targeting the most costly causes of injury, combined with the most vulnerable population groups, can generate real savings for BC. Combined, these conservative injury reduction targets could produce over $180 million in savings annually. More savings could be available through the development of an injury prevention and control strategy. For example, an across the board injury reduction target of 30 per cent could produce over $616 million in savings.

FALLS AMONG THE ELDERLY

This study has shown that $180 million of the $437 million in direct costs spent on falls was devoted to treating falls among the elderly (see fig. 9). It is estimated that about 40 per cent of falls leading to hospitalization are the result of hip fractures, and that the number of hip fractures in Canada will increase dramatically from 23,375 in 1993 to over 88,000 cases by the year 2041 as the Canadian population ages (Papadimitropoulos et al., 1997).

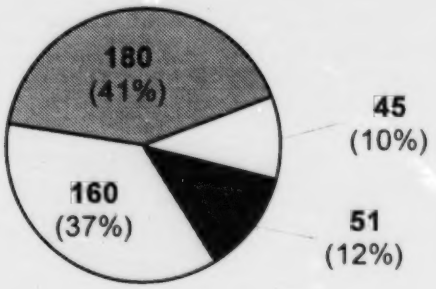
These are falls that can be prevented by recognizing risk factors such as a history of falls, impairment related to cognition, balance and gait, low body mass index, the misuse of medications and hazards in the home. By targeting these risk factors through prevention programs, setting a hospitalization reduction target of 20 per cent could lead to over 1,400 fewer hospital stays and 350 fewer elderly people of BC permanently disabled. The overall savings could amount to almost $25 million annually.

[5] Centers for Disease Control and Prevention (2000). Working to Prevent and Control Injury in the United States - Fact Book for the Year 2000. National Center for Injury Prevention and Control, Atlanta.

FIGURE 9

Direct Costs of Falls by Age Group (Millions $)

(direct costs of falls = $437)



FALLS FOR THOSE 0 TO 24 YEARS OF AGE

Research from the report "B.C. Injury Free – A Framework for Action"[6] provides an overview of unintentional injury in BC and further illustrates the injury prevention and control challenge.

Specifically, injuries from falls of those 0 to 24 years of age cost BC $258 million every year. These are falls that can be prevented by redesigning the structure of playgrounds, targeting hazards in the home, by simply teaching children how to fall and by gaining a better understanding of how youth perceive risk in their lives.

If these types of prevention strategies reduce the incidence of falls by 20 per cent for those aged 0-24, there would be 263 fewer hospitalized cases in BC, over 2,500 fewer non-hospitalized injuries, and almost 100 fewer injuries leading to permanent disability. The net savings could total over $25 million every year.

PREVENTING MOTOR VEHICLE CRASHES

Wearing seat belts and installing air bags can reduce motor vehicle injuries by 61 per cent. Drinking and driving is responsible for about 40 per cent of all fatal motor vehicle crashes. It is estimated that mortality can be reduced by 20 per cent through a reduction in drunk driving. Reducing speed limits by 10 km an hour could lead to a 15 per cent decrease in mortality, with the number of deaths lowered and severity of injury reduced.

With a 10 per cent reduction in crashes caused by poor road design and maintenance, and based on the assumption that 20 per cent of those injured end up in hospital, there would be about 147 fewer deaths each year. By implementing a prevention strategy based on buckling up, driving sober, slowing down and looking first on the roads, there would also be almost 1,200 fewer hospitalizations, about 3,200 fewer injuries treated outside a hospital setting and 287 fewer injuries leading to permanent disability. The net savings to the people of BC would amount to $130 million annually.

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[6] B.C. Ministry of Health (Office for Injury Prevention) & Ministry Responsible for Seniors (1997).

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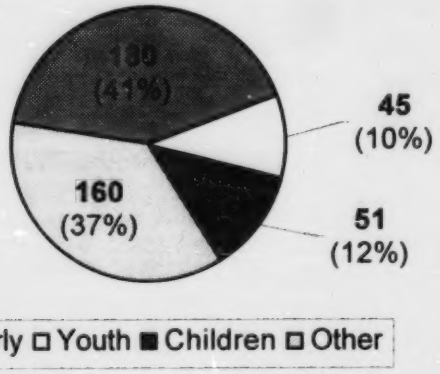

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Putting a Price Tag on Prevention

Preventing injuries saves money and lives. The goal of reducing costs and human suffering can be reached by integrating existing government and community-based programs into a provincial injury prevention strategy. A recent study estimated that diabetes costs the Canadian economy $1.1 billion annually. In response, governments and non-governmental organizations devised and funded a five year, $115 million Canadian Diabetes Strategy. This adds to the list of several national strategies for various health conditions. A key question emerges: are the economic costs of unintentional injury comparable to other priority areas?

Nationally, the annual societal costs for unintentional injury amount to almost $9 billion. In comparison to other health conditions, unintentional injury would rank in the top five in terms of societal economic burden. The issue is not investing in one health problem at the expense of another. Rather, the key issue is the funding and formulation of a strategy. We know that strategies are essential to the control of many health problems.

The findings of this study point to the payoffs that BC could reap through investing in a provincial injury prevention strategy. Importantly, a provincial strategy could be substantially enhanced through integration with a national strategy. At this point in time, Canada does not have a national strategy for injury prevention and control.

The Policy Context

Progress towards developing a national injury prevention strategy has been made in the past. But it has not moved forward. For example, strategists working in 1991 on a project entitled A Safer Canada: Year 2000 Injury Control Objectives developed a series of prevention objectives. They recommended that the Government of Canada recognize injuries as a major cause of death and disability that requires a national prevention strategy. They encouraged the development of national injury control objectives for the purpose of stimulating projects across the country. They also called for the establishment of a national injury surveillance system.

None of the recommendations has been fully realized. The results of The Economic Burden of Unintentional Injury in BC demonstrate that a provincial injury prevention strategy is not only essential, it is integral to the fight against this silent epidemic.

While it goes without saying that the primary goal is to reduce human pain and suffering, the societal implications also have to be made clear. Unintentional injury is the number one killer of young Canadians. As our population ages and as we move towards a new economy, BC's and Canada's future is dependent on this shrinking body of human capital. We can ill afford the current losses in face of the demographic and economic changes that lie ahead.

Conclusion

Every hour of every day, 48 people in BC are unintentionally injured (almost 1,200 per day), roughly 4 people in BC die daily from these injuries and almost 10,000 are disabled every year. Overall, over 400,000 residents of BC are injured each year. There exists an opportunty to enhance the core existing injury prevention programs and policies to ultimately improve the quality of life of British Columbians.

Appendix A

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Appendix B

TABLE 1

Deaths Resulting from Unintentional Injury, Distribution by Major Category, British Columbia, 1998

Major Cause of Death	Number	% Distribution
Poisoning	433	27.8%
Motor Vehicle Crashes	380	24.4%
Falls	358	23.0%
Drowning and Suffocation	207	13.3%
Fires	33	2.1%
Water Transport	27	1.7%
Air & Space	15	1.0%
Railway	7	0.4%
Other	96	6.2%
Total	1,556	100.0%

TABLE 2

Unintentional Injuries Resulting in Hospitalization, Distribution by Major Category, British Columbia, 1998

Major Cause	Number	% Distribution
Falls	14,273	53.5%
Motor Vehicle Crashes	4,352	16.3%
Poisoning	741	2.8%
Pedal Cycle	731	2.7%
Fires	208	0.8%
Water Transport	136	0.5%
Drowning and Suffocation	64	0.2%
Air & Space	32	0.1%
Railway	18	0.1%
Other	6,132	23.0%
Total	26,687	100.0%

TABLE 3

Unintentional Injuries Resulting in Non-Hospitalization, Distribution by Major Category, British Columbia, 1998

Major Cause	Number	% Distribution
Falls	158,307	40.0%
Motor Vehicle Crashes	36,511	9.2%
Pedal Cycle	8,461	2.1%
Poisoning	7,492	1.9%
Fires	4,599	1.2%
Water Transport	2,115	0.5%
Drowning and Suffocation	455	0.1%
Air & Space	399	0.1%
Railway	333	0.1%
Other	177,017	44.7%
Total	395,688	100.0%

TABLE 4

Unintentional Injuries Resulting in Disability, Distribution by Major Category, British Columbia, 1998

Major Cause	Partial Permanent Disability	Total Permanent Disability
Falls	5,175	379
Motor Vehicle Crashes	1,047	146
Pedal Cycle	245	22
Poisoning	138	3
Fires	103	5
Drowning and Suffocation	13	6
Water Transport	48	4
Air & Space	11	1
Railway	7	1
Other	2,214	170
Total	9,002	737

TABLE 5

Direct Costs ($Thousands) Resulting from Unintentional Injury, Distribution by Major Cause of Injury and Type of Expenditure, British Columbia, 1998

Expenditure Category	Motor Vehicle Crashes	Falls	Drowning and Suffocation	Poisoning	Fires	Other	Total
Hospitalized Cases							
Hospital	14,745.0	68,903.9	127.4	1,200.6	722.0	19,234.2	104,933.2
Medical	12,883.4	53,284.9	100.0	876.7	298.0	15,384.5	82,827.5
Rehabilitation	968.7	3,491.3	24.2	99.2	22.0	1,224.6	5,830.0
Sub-Total	**28,597.2**	**125,680.1**	**251.5**	**2,176.5**	**1,042.1**	**35,843.3**	**193,590.7**
Non-Hospitalized Cases							
Medical	8,018.4	61,144.4	127.5	2,873.7	732.6	45,087.0	117,983.7
Rehabilitation	531.2	4,121.1	15.4	41.4	117.9	3,431.6	8,258.7
Sub-Total	**8,549.6**	**65,265.5**	**142.9**	**2,915.2**	**850.5**	**48,518.7**	**126,242.4**
Permanent Disability	**93,763.2**	**245,798.9**	**1,897.0**	**9,973.7**	**4,968.3**	**176,205.0**	**532,606.2**
Total Direct	**130,910.0**	**436,744.6**	**2,291.4**	**15,065.4**	**6,860.9**	**260,566.9**	**852,439.2**

TABLE 6

Indirect Costs ($Thousands) Resulting from Unintentional Injury, Distribution by Major Cause of Injury and Type of Productivity Loss, British Columbia, 1998

Category of Productivity Loss	Motor Vehicle Crashes	Falls	Drowning and Suffocation	Poisoning	Fires	Other	Total
Morbidity Costs							
Cases While Hospitalized	1,227.5	1,378.2	2.6	56.0	69.9	969.8	3,704.0
Partial Permanent Disability	76,307.0	184,058.1	1,092.1	9,777.4	8,905.2	191,612.7	471,752.5
Total Permanent Disability	64,240.8	88,509.6	2,440.7	1,526.2	2,573.2	81,980.1	241,270.5
Sub-Total	**141,775.3**	**273,945.9**	**3,535.3**	**11,359.6**	**11,548.3**	**274,562.5**	**716,726.9**
Mortality Costs	**155,604.7**	**17,653.0**	**49,515.8**	**189,417.2**	**14,578.2**	**56,995.9**	**483,764.8**
Total Costs	**297,380.0**	**291,598.8**	**53,051.1**	**200,776.8**	**26,126.5**	**331,558.5**	**1,200,491.7**

TABLE 7

Total Economic Costs ($Thousands) Resulting from Unintentional Injury, Distribution by Major Cause of Injury and Type of Productivity Loss, British Columbia, 1998

Cost Category	Motor Vehicle Crashes	Falls	Drowning and Suffocation	Poisoning	Fires	Other	Total
Direct Costs							
Hospitalized Cases	28,597.2	125,680.1	251.5	2,176.5	1,042.1	35,843.3	193,590.7
Non-Hospitalized Cases	8,549.6	65,265.5	142.9	2,915.2	850.5	48,518.7	126,242.4
Disability	93,763.2	245,798.9	1,897.0	9,973.7	4,968.3	176,205.0	532,606.2
Total Direct	**130,910.0**	**436,744.6**	**2,291.4**	**15,065.4**	**6,860.9**	**260,566.9**	**852,439.2**
Indirect Costs							
Morbidity Costs	141,775.3	273,945.9	3,535.3	11,359.6	11,548.3	274,562.5	716,726.9
Mortality Costs	155,604.7	17,653.0	49,515.8	189,417.2	14,578.2	56,995.9	483,764.8
Total Indirect	**297,380.0**	**291,598.8**	**53,051.1**	**200,776.8**	**26,126.5**	**331,558.5**	**1,200,491.7**
Total Costs	**428,290.0**	**728,343.4**	**55,342.5**	**215,842.3**	**32,987.4**	**592,125.4**	**2,052,931.0**

TABLE 8

Summary of Total Economic Costs Resulting from Unintentional Injury, Distribution by Major Cause of Injury, British Columbia, 1998

Cause of Injury	Total Cost	Direct Cost	Indirect Cost
Falls	728,343,387	436,744,573	291,598,814
Motor Vehicle	428,290,000	130,910,005	297,379,994
Poisoning	215,842,266	15,065,447	200,776,819
Pedal Cycle	60,719,799	27,565,548	33,154,251
Drowning and Suffocation	55,342,516	2,291,377	53,051,138
Fires	32,987,408	6,860,925	26,126,483
Water Transport	22,280,184	4,700,965	17,579,219
Air and Space	8,619,281	1,079,268	7,540,013
Railway	5,362,715	759,428	4,603,287
Other	495,143,401	226,461,709	268,681,692
Total	**$2,052,930,955**	**$852,439,246**	**$1,200,491,710**

TABLE 9

Percent Distribution of Total Costs, by Major Category, British Columbia, 1998

Cause of Injury	Total Cost	% of Total
Falls	728,343,387	35.5%
Motor Vehicle	428,290,000	20.9%
Poisoning	215,842,266	10.5%
Pedal Cycle	60,719,799	3.0%
Drowning and Suffocation	55,342,516	2.7%
Fires	32,987,408	1.6%
Water Transport	22,280,184	1.1%
Air and Space	8,619,281	0.4%
Railway	5,362,715	0.3%
Other	495,143,401	24.1%
Total	**$2,052,930,955**	**100.0%**

TABLE 10

Scenario 1: Population Effects on Economic Costs of Unintentional Injury, British Columbia

Year	Population	Total Cost $ Millions	Direct Cost $ Millions	Indirect Cost $ Millions
1998	3,998,325	$2,052.9	$852.4	$1,200.5
2010	4,411,729	$2,228.7	$956.6	$1,272.0
% Increase	10.3%	8.6%	12.2%	6.0%

SENSITIVITY TABLES

Change of Discount Rate

Discount Rate	Total Cost $ Millions	Direct Cost $ Millions	Indirect Cost $ Millions
3% (Base Case)	$2,052.9	$852.4	$1,200.5
5%	$1,599.7	$693.0	$906.7
% Change	-22.1%	-18.7%	-24.5%

Change of Unemployment Rate

Unemployment Rate	Total Cost $ Millions	Direct Cost $ Millions	Indirect Cost $ Millions
8.79% (Base Case)	$2,052.9	$852.4	$1,200.5
5%	$2,102.8	$852.4	$1,250.4
% Increase	2.4%	0.0%	4.2%

Appendix C

METHODOLOGY AND DATA APPENDIX

This study was conducted using an incidence costing approach. That is, the incident population injured in British Columbia in 1998 was costed over the lifetime of injured individuals. The costs, both direct and indirect, were discounted to a present value in 1998 at 3 per cent per annum. Details on the incidence costing methodology are given in The Economic Burden of Unintentional Injury in Canada, pp. 15-20.

MORTALITY

Mortality data were provided by the British Columbia Vital Statistics Agency. The agency maintains large databases for all births and deaths in the province by way of the Registration of Birth, the Physician's Notice of Birth, the Registration of Death, and the Medical Certification of Death. The agency assigns events to geographic regions based on the postal code of usual residence. The data file included external causes of death based on the International Classification of Diseases (ICD-9) by five-year age groups, and sex. Population denominators are from the Statistics Canada CANSIM database, also by five-year age groups, and sex.

Mortality costs were restricted to indirect costs related to earnings lost due to death over what would have been the remaining working-life of individuals had they lived. Data from the Statistics Canada CANSIM database on participation rates, unemployment rates and average earnings was used in these calculations. A real wage growth rate of 1 per cent per year was assumed.

HOSPITALIZED INJURIES

The BC Ministry of Health, Regional Performance Analysis Branch, provided acute hospital separation data[7] for all injury hospitalizations in the province of British Columbia. The data for this study included external causes of injury based on the International Classification of Diseases (ICD-9) (WHO, 1975) by age (five year age groups) and gender. Source data are based on Morbidity Database, Information Support, BC Ministry of Health Planning, and BC Ministry of Health Services. Health Data Warehouse release date was March 2001.

Hospital costs were estimated using the Inpatient Cost per Inpatient RIW, calculated from the BC Cost per Weighted Case Report, Version 6.0, provided by the BC

[7] Hospitals must complete a discharge record for every patient admitted to their facilities. Every patient admitted to a BC hospital has a record produced upon discharge that includes details about the person and the related stay. Data are collected for each department (except emergency departments) including acute, rehabilitation, extended care and day surgery patients. For this study, only acute discharges were included. Any person whose stay is over 6 hours must be formally admitted. Since a patient may be admitted to hospital and discharged several times during a given year, the data are counts of separations rather than individual patients or encounters. Data collection follows specifications laid out by the BC Ministry of Health and the abstracts are sent to the Canadian Institute for Health Information (CIHI) for coding and processing. Data are collected for the fiscal year April 1 to March 31 based on discharge date.

Ministry of Health & Ministry Responsible for Seniors. Medical and rehabilitation costs were calculated using hospital costs in conjunction with the distribution of ICD-9 N-codes by ICD-9 E-codes derived from CIHI hospital data, and Table 5.6 of the Databook on Nonfatal Injury. Indirect costs were limited to lost earnings during hospitalization.

NON-HOSPITALIZED INJURIES

Non-hospitalized injuries were estimated using BC hospitalized injuries in conjunction with the distribution of ICD-9 N-codes by ICD-9 E-codes derived from CIHI hospital data, and Table 4.3 of the Databook on Nonfatal Injury.

Medical and rehabilitation costs were calculated using the BC hospital costs in conjunction with the distribution of ICD-9 N-codes by ICD-9 E-codes derived from CIHI hospital data, and Tables 5.6 and 5.9 of the Databook on Nonfatal Injury.

DISABILITY

Partial permanent and total permanent disability from injury was estimated using both hospitalized and non-hospitalized injury in conjunction with the distribution of ICD-9 N-codes by ICD-9 E-codes derived from CIHI hospital data, and Tables 4.12 and 4.15 of the Databook on Nonfatal Injury.

Long-term medical costs were calculated using BC hospital costs in conjunction with Tables 3.1 and 3.2 of the Databook on Nonfatal Injury, while the indirect cost associated with income loss was assumed to be 100 per cent for total permanent disability, and 17 per cent for partial permanent disability.

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